

**HUNTING, USE, AND KNOWLEDGE  
OF THE BIOLOGY OF THE WHITE-TAILED DEER  
(*Odocoileus virginianus* Hays)  
BY THE MAYA OF CENTRAL YUCATAN, MEXICO**

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**ABSTRACT.**—We present an account of different deer hunting techniques used by the Maya of Tixcacaltuyub, Yucatan, Mexico. The *batida*, or drive hunt, is highly favored at present. When a deer is shot, the person who actually killed it has the privilege of looking for the *Tunich* (a small good luck stone found sometimes in the stomach), and taking the right leg, the head, the stomach, and the liver. The rest is divided among other party members. Deer are shared with the whole village only when hunting is associated with a religious celebration (i.e., *Ch'a' Chaak*). We present a list of plant species, both cultivated in *milpas* and part of the native vegetation, that form the diet of deer in the area, and an account of the knowledge hunters have of deer biology. Finally, we discuss the decrease in deer population densities and the importance of implementing a vegetation management program that balances the amount of land with young and mature forest vegetation and that dedicated to agriculture, in order to have a mosaic that will satisfy the nutritional and other requirements of deer.

**RESUMEN.**—Presentamos una reseña de diferentes técnicas para cazar venados usadas por los mayas de Tixcacaltuyub, Yucatán, México. La batida, o cacería en grupo, es actualmente un método favorito. Cuando un venado es cazado, la persona que lo mató tiene el privilegio de buscar el *tunich* (una piedra pequeña de buena suerte, encontrada a veces en el estómago), y el derecho a una pierna, la cabeza, el estómago y el hígado; el resto se reparte entre los otros miembros de la batida. Los venados se comparten con toda la comunidad únicamente cuando la caza esta relacionada con una festividad religiosa (por ejemplo el *ch'a' chaak*). Presentamos una lista de las especies de plantas, ya sea cultivadas en las milpas o parte de la vegetación natural, que forman la dieta básica del venado en la zona, y un resumen del conocimiento que tienen los cazadores de la biología del venado. Finalmente, discutimos la disminución en la densidad de población del venado y la importancia de implementar un programa de manejo de la vegetación que mantenga un balance entre la extensión de terreno con bosque joven y maduro, y el área dedicada a la agricultura, de tal manera que se tenga un mosaico que satisfaga los requerimientos nutricionales, entre otros, del venado.



**RÉSUMÉ.**—Nous présentons différentes techniques utilisées par les Mayas de Tixcacaltuyub de Yucatán au Mexique. La *batida*, ou chasse en groupe, est la méthode préférée actuellement. Quand un daim est tué, le chasseur qui l'a abattu a le privilège de chercher le *Tunich* (une petite pierre qui porte chance qui se trouve parfois dans l'estomac), et droit à une jambe, la tête, l'estomac, et le foie; le reste est réparti entre les autres chasseurs. La seule occasion où un daim est partagé avec le reste des habitants de la communauté est lorsque la chasse est liée à une fête religieuse (par exemple *Ch'a' Chaak*). Nous présentons une liste des plantes, soit cultivées dans les *milpas*, soit éléments de la végétation naturelle, qui correspond à l'alimentation du daim dans la région, et une description du savoir élémentaire des chasseurs sur la biologie des daims. Finalement, nous abordons la diminution de densité de la population des daims et l'importance de la mise en place d'un programme de gestion de la végétation qui maintienne un équilibre entre la quantité du territoire dédié aux activités agricoles et celui couvert de végétation jeune et relativement mûre, afin de satisfaire les exigences d'alimentation et de reproduction des daims.

## INTRODUCTION

Deer have been exploited by the Maya since pre-Hispanic times (Cibeira 1977; Freidel 1978; Landa 1982; Morley 1965). Even though deer population densities have declined dramatically in the Yucatan Peninsula due to excessive hunting and habitat destruction (Carrillo 1987; Hernández et al. 1974; Leopold 1965), and hunting is now banned, deer remain an important source of animal protein for the Maya (Carrillo 1987; Gaumer 1917; Redfield and Villa-Rojas 1934; Yah 1983). Two species of deer inhabit the Yucatan Peninsula, the white-tailed deer or *Keej* (*Odocoileus virginianus* Hays), and the brocket deer or *Yuk* (*Mazama americana* Merriam) (Hall 1981). Yucatecan Maya prefer *Keej* because they are larger and their meat tastes better. In this paper we describe the hunting methods and exploitation of the white-tailed deer by the inhabitants of a rural Mayan community in central Yucatan, Mexico. We also present an account of the hunters' knowledge of deer biology and a list of plant species that form the diet of deer in the area.

## STUDY AREA AND METHOD

Fieldwork was done in the Mayan community of Tixcacaltuyub, Yucatan, Mexico (20°27' N, 88°59' W; 18-24 m elevation). Climate is warm, subhumid, with a dry season in winter and early spring and a rainy season between June and October. Mean annual temperature is 27.5°C and total annual precipitation is 900-1,000 mm. As in the rest of Yucatan, the Tixcacaltuyub area is relatively flat, with no rivers, and surface soil is scarce or lacking, with many exposed limestone outcrops. Most land is dedicated to *milpas*, mixed fields of corn, beans, and several species of squashes, or cattle raising. The vegetation of this region is described by Miranda (1958) as a variety of tropical deciduous forest (*selva mediana subdecidua*) with canopy height at 25-30 m. Present-day vegetation is a mosaic of young successional stages (i.e., 1-20 years of abandonment) dominated by a mixture



of species from the deciduous and dry tropical forests that dominate the northern portion of the Yucatan Peninsula (Rico-Gray and Garcia-Franco 1991b). Only minimal areas, confined to private ranches, are covered by forests with some resemblance to the original vegetation (Rico-Gray et al. 1988b). A recent vegetation survey in the area (Rico-Gray and Garcia-Franco 1991b) reports in most regrowth stages the presence of the following shrub and tree species: *Acacia* sp., *Apoplanesia paniculata* Presl., *Bunchosia swartziana* Griseb., *Bursera simaruba* (L.) Sarg., *Caesalpinia gaumeri* Greenm., *Cnidoscolus aconitifolius* (Mill.) I.M. Johnston, *Cordia gerascanthus* L., *Croton glabellus* L., *Diospyros anisandra* Blake, *D. cuneata* Standl., *D. verae-crucis* (Standl.) Standl., *Eugenia mayana* Standl., *Gliricidia sepium* (Jacq.) Steud., *Gymnopodium floribundum* Rolfe, *Hampea trilobata* Standl., *Jatropha gaumeri* Greenm., *Lysiloma latisiliquum* (L.) Benth., *Machaonia lindeniana* Baillon, *Neomillspaughia emarginata* (Gross.) Blake, *Piscidia piscipula* (L.) Sarg., and *Pithecellobium albicans* (Kunth.) Benth. Ten of these species account for more than 50% of the total of relative importance value per regrowth year, but each regrowth year is dominated by different species, for example: Year 10, *N. emarginata*, *Helicteres baruensis* Jacq., *Gymnopodium floribundum*, *L. latisiliquum*, *Mimosa bahamensis* Benth.; Year 15, *Pithecellobium albicans*, *L. latisiliquum*, *Bursera simaruba*, *G. floribundum*, *Croton glabellus*; Year 30, *B. simaruba*, *G. floribundum*, *E. mayana*, *L. latisiliquum*, *N. emarginata*; Year 40, *E. mayana*, *B. simaruba*, *Caesalpinia gaumeri*, *G. floribundum*, *N. emarginata*; Year 100, *G. floribundum*, *Vitex gaumeri* Greenm., *B. simaruba*, *Psidium sartorianum* (Berg.) Niedenzu, *Bunchosia swartziana*.<sup>1</sup> Most of these species regenerate from coppiced shoots.

Fieldwork was done in March and August, 1988. Information was obtained through open interviews with 11 Mayan peasants who were dedicated to subsistence hunting. Interviews were complemented with field observations aimed at recognizing some of the plant species used for food by deer.<sup>2</sup> We examined recent deer trails and assessed the damage deer browsing had caused to plants along the trails.

## RESULTS

*Deer hunting.*—Deer hunting is a male activity. There are approximately 50 hunters in the village of 250 families. Hunting takes place year round, but the dry season, November through May, is preferred because the trees and many shrubs have shed their leaves and animals are easier to see. The dry season is also a time of low activity for farmers in the corn fields. Deer are hard to find at present, and as a rule Tixcacaltuyub hunters shoot only one animal per hunting trip. In other Yucatecan communities, such as Xul, four or five animals may be shot per hunting trip, and usually two hunting trips are made per month (Sanabria 1986). This difference is the result of there being more deer in those areas. One of the best hunters in Tixcacaltuyub had killed six animals (four *Keej* and two *Yuk*) between January and August, 1988, while another hunter shot four during the same period. Other hunters may not kill an animal for years, even though they try. The number of animals killed varies from year to year as a result of hunting ability, weather, and condition of vegetation. There were, for example, only 20 deer (*Keej*) killed in Tixcacaltuyub during 1987. The main motivation for hunting is the lack of



enough money to buy meat such as pork. Other motives include having had very good luck before, enjoyment of hunting, and for celebrations. Deer hunters have two basic objectives: (1) to find and possess the *virtud* (virtue, ability, good luck) to hunt more deer, and (2) to obtain animal protein.

It is believed that *virtud* is obtained from killing a deer with a small tusk or a small stone, or *Tunich*, in its stomach. The person who shoots the deer, even though he may be hunting in a group, retires with the catch, opens the stomach of the animal, and looks for the *Tunich*. If the *Tunich* is found, he takes it, keeps it for himself, and hides it in a secure place. The *Tunich* has to be carried whenever he goes hunting. After a certain period of time, it is better to return the *Tunich* to the deer (i.e., leave the stone in the forest), because it may be harmful to the hunter if kept for a long time.

Based on the information obtained through interviews in Tixcacaltuyub, deer hunting is accomplished using five methods:

(1) *Batida* (drive hunting or group hunting). This method has been used by the Maya since pre-Hispanic times (Landa 1982), and it is often used today in Tixcacaltuyub, as well as in other communities (Arias and Hernández X. 1981; Redfield and Villa-Rojas 1934; Sanabria 1986; Yah 1983). Hunting by this method takes place during the day. Four to eight hunters (sometimes 20) and 12 to 18 trained dogs take part. *Batida* consists of selecting and surrounding 4,000 to 8,000 square meters of a *Hubché* (a certain vegetation successional stage; see below) where a deer has been spotted. The hunters form a semicircle, taking positions every 60 to 80 m, and wait. One or two hunters then enter the *Hubché* with the dogs and drive the deer towards the hunters forming the circle, who shoot at it.

(2) *Acecho* (stalk). This method was also used by the pre-Hispanic Maya (Gaumer 1917; Landa 1982), but due to its difficulty it is seldom used today in Tixcacaltuyub. *Acecho* is based on in depth knowledge of the habits and movements of deer. This was an easier method to use when deer were more abundant, but present scarcity almost prohibits its use. During the day this method is carried out by an individual hunter, without the help of dogs. The deer is tracked and shot if found. A slightly different version of this method is when the hunter uses a call (e.g., the call of fawn to mother, female to male, or of a scared animal) to attract the deer after it has been located. The call is made with the help of the hunter's hands, nose, and mouth, or by using a special whistle.

(3) *Espera* (wait). Basically, one to three hunters climb neighboring trees strategically located near a corn field (*milpa*) or a water source (*haltún* or *sarteneja*, see Flores 1983), and wait for deer to appear. The *espera* is accomplished either during the day or night, but preferably at sundown or sunrise.

(4) *Lampareo* (light-spotting, use of a light source). This is an active hunting method; deer are searched for by night with the use of a light source at specific sites in the forest or where deer trails enter the *milpas*. This method has been commonly used in Mexico; its use has helped to decrease deer populations severely (Leopold 1965).

(5) *Sorpresa* (surprise). In general, deer hunting is a conscious decision; hunters get together and plan hunting trips. Nevertheless, most peasants carry their rifles when working in their *milpas*; a deer may be encountered in the corn field during the day and killed without an organized hunting trip.



Once a deer has been killed, it is carried back to Tixcacaltuyub and divided among the hunters. The person who actually killed the deer has the right, by tradition, to one leg, the head, the stomach, and the liver. The liver is highly appreciated. In other Yucatecan communities a hunted deer is divided in the same way (Yah 1983). An adult male deer may yield up to 35 kg of boneless meat, while a young animal or an adult female yields about 25 kg. Meat and entrails are sold in the village (2.50 USCY per kilogram) or consumed by the family. Venison is used to prepare *Pibil* or *Pib* (*asado*), *Chokmole*, *salada*, *ahumada*, *pipian*, and *Tzik* (*salpicón*) (see Ucan Ek et al. 1983 for some Yucatecan recipes). Bones, stomach contents, and intestines are offered to the dogs and pigs. The scrotum may be transformed into a bag. Skin is sold at 0.50 USCY per kilogram; the hunters may obtain up to 4 kg of skin from a large animal. Antlers may be used as cloth hangers or to shell corn. Venison is not marketed to the state capitol, Merida, where it can bring up to 6.00 USCY per kilogram.

The only time a hunted animal is shared with other village inhabitants is when hunting is part of festivity, like the *Ch'a' Chaak* ceremony or worship to the rain god *Chaak*. Historians report that the ancient Maya also used venison in their religious ceremonies or as tribute (Landa 1982; Morley 1965).

Other mammals hunted by the Maya of Tixcacaltuyub are *temazate* or *Yuk* (*Mazama americana* Merriam), *Pecarí de collar* or *Kitsitam* (*Tayassu tajacu* Merriam), *conejo* (*Sylvilagus floridanus* Miller), *armadillo* or *Wesh* (*Dasypus novemcinctus* Peters), *tepezcuintle* or *Jaleb* (*Agouti paca* Goldman), and *tejón* or *Ekpáy* (*Nasua nasua* J.A. Allen). Birds are also hunted; the most important species are *pavo de monte* (*Agriocharis ocellata* Cuvier), *chachalaca* (*Ortalis vetula* Wagler), and *codorniz* and *perdiz*, two Phasianidae.

*Hunter knowledge of deer biology.*—The following account is a description of different aspects of deer biology known to the hunters of Tixcacaltuyub. White-tailed deer (*Keej*) are given different names according to age, antler characteristics, size, and hair color (Table 1); sex is not differentiated.

The Maya classify vegetation in a complex and accurate way (Flores and Ucan Ek 1983; Sanabria 1986). The basic division is between young forest (*monte bajo*) and old forest (*monte alto*), each with subdivisions based on time elapsed since previous use. This classification may vary slightly among different communities (Paulino Simá, personal communication, 1988). *Keej* are found both in young and old forests, but prefer the former because they find more food and protection against insects. Vegetation types used by deer are *Kabal hubché* (2-10 years since previous use), *Tankel hubché* (10-20 years), *Yax k'aax* (20-30 years), *Nukuch k'aax* (more than 40 years), and *milpas*. Deer prefer the young forest, particularly the *Kabal hubché*, because there is more food and more places to sleep and raise their young. Deer mate and young are born in the *Kabal hubché*. Old forests are used less than young forests; they are used for shade and feeding. Deer feed primarily in the early morning (4:00-7:00 A.M.) and evening (6:00 P.M. to 1:00 A.M.); they do not eat just any plants, preferring leaves and tender shoots. Hunters consider them to be delicate eaters. Deer also feed in the *milpas*. The *milpa* is preferred in August (rainy season), because after the vegetation has been felled and burned for new *milpas*, rain triggers resprouting from coppiced trunks. Deer prefer



TABLE 1.—Names used by the hunters of Tixcacaltuyub, Yucatan, Mexico, to refer to deer of different ages and characteristics.

Local Name	Description
<i>Keej</i>	White-tailed deer
<i>Yalem keej</i>	Fawn
<i>Tankelem keej</i>	Yearling
<i>Nojoch keej</i>	Adult
<i>Jaabenté</i>	Young male with first antlers
<i>Putsna ab</i>	Male with one point per antler
<i>Kaak jeek'</i>	Male with two points per antler
<i>Oox jeek'</i>	Male with three points per antler
<i>Kankan jeek'</i>	Male with four points per antler
<i>Cacao bak</i>	Male with very small wide-based antlers, similar to Cacao fruit
<i>Tzo ots bak</i>	Male with velvety antlers
<i>Yaax nik</i>	Large males/females with green-black hair
Rojos	Small males/females with reddish hair, but not the color of <i>Yuk</i>

these tender leaves and shoots, particularly *Neomillspaughia emarginata* (*Saj iitsá*) and *Gymnopodium floribundum* (*Ts'iits'il ché*). Hunters say that deer do not eat growing corn; this contradicts some published reports (Leopold 1965; Sanabria 1986). Deer only drink water during the dry season, when they use *sartenejas*, small, natural holes or depressions in the rock which fill with rain water (see Flores 1983 for a detailed description of *sartenejas*). Deer obtain water by feeding on succulents and vegetation wet from morning dew.

*Plant species used for food by deer.* —The hunters of Tixcacaltuyub consider that the following plant species form the basic diet of deer in the area: *Abutilon gaumeri* Standl. (*Ya'ax jool*; secondary growth, leaf), *Bursera simaruba* (L.) Sarg. (*Chakaj*; secondary growth and mature forest, leaf), *Caesalpinia violacea* (Miller) Standl. (*Chakte'*; secondary growth and mature forest, leaf), *Capsicum* spp. (*chiles*; *milpa*, leaf and young fruit), *Chochlospermum vitifolium* Willd. ex Spreng. (*Chu'um*; secondary growth and mature forest, leaf), *Colubrina greggii* S. Watson (*Churumay*; secondary growth, leaf), Cucurbitaceae (a number of species; *milpa*, leaf and young fruit), *Eugenia axillaris* (Swartz) Willd. (*Kiis yuuk*; mainly secondary growth, leaf), *Gymnopodium floribundum* Rolfe (*Ts'iits'il ché*; secondary growth and *milpa*, tender leaves and shoots), *Ipomoea batatas* (L.) Poir. (*camote*; *milpa*, leaf), *Jacquemontia pentantha* (Jacq.) G. Don (*Izakil camote*; young secondary growth, leaf in dry season), *Merremia aegyptia* (L.) Urban (*Tso' ots k'ab*; young secondary growth, leaf), *Metopium brownei* (Jacq.) Urban (*Chechem*; secondary growth and mature forest, fruit), *Neomillspaughia emarginata* (Gross.) Blake (*Sajiitsá*; secondary growth



and *milpa*, tender leaves and shoots), *Pachyrrhizus erosus* (L.) Urban (*jicama*; *milpa*, leaf), *Phaseolus* spp. (*Iibes*; *milpa*, leaf), *Quamoclit coccinea* (L.) Moench (*Chak lool*; young secondary growth, leaf), *Salvia coccinea* Juss. ex Murr. (*Chak tsits*; young secondary growth, leaf), and *Viguiera dentata* (Cav.) Spreng (*Taj'*; young secondary growth, leaf). Captive fawns are fed sheep or goat's milk; yearlings and adults are fed leaves of *Brosimum alicastrum* Swartz (*Ox*), corn (grain, *tortilla*, *masa*), or leaves of plants brought from the field.

## DISCUSSION

Venison has traditionally been an important source of animal protein in the diet of the Yucatecan Maya. However, deer hunting was banned in the Yucatan Peninsula in April 1987; this law prohibits hunting, marketing, and selling venison in restaurants. As shown by the results of this study, this law is not respected by peasants in small villages. Is prohibition of hunting the best way to increase deer population densities in the Yucatan? One of the oldest Mayan hunters interviewed expressed this view: "In the past, one could choose the quarry with great care, you only shot the big males, never the young or females. At present, even the young and females are killed, if this goes on they will vanish. As time passes the animals are more scarce, there are more hunters, and less appropriate areas to look for deer. If hunting was stopped for four or five years, we will once again have deer for everyone." We consider that the main causes for the decrease in deer population numbers are habitat destruction and hunting for commercial trade; subsistence hunting by the Maya was not a real threat in the past. At present, excessive subsistence hunting coupled with an increase in areas lacking natural vegetation or in early regrowth stage (1-6 years) relative to areas with more mature forest (40-60 years) may be a threat to deer populations.

The vegetation of the Yucatan Peninsula has been cleared by man for a variety of purposes (e.g., logging, cattle raising, sisal and orchard plantations), dramatically modifying the natural habitat of deer. Modification of mature forest communities has both positive and negative effects on deer populations: (1) young secondary growth and *milpas* create ideal feeding habitats for deer, because many plant species resprout after slash-and-burn practices, providing readily accessible and palatable feed, and (2) deer need more mature vegetation for resting, mating, and raising their young. If the Yucatecan forests were under a management system that would allow the Maya to exploit while conserving, then there would be no need to worry about deer scarcity. This program should consider the establishment and maintenance of areas with both young and old vegetation, a mosaic to satisfy fully the nutritional and other requirements of deer (Rico-Gray et al. 1991). The Maya have developed and used a variety of agro-silvicultural techniques, which have formed the basis of their vegetation management system (Chemás and Rico-Gray 1991; Gómez-Pompa 1987a, 1987b; Gómez-Pompa et al. 1987; Rico-Gray and García-Franco 1991a; Rico-Gray et al. 1985, 1988a, 1988b, 1990, 1991). The careful study and adaptation of these techniques to modern needs should be attempted to make a better use of our natural resources. Of particular interest should be the study of the interaction between traditional forest manage-



ment, its effect on deer populations, and the economic and cultural factors that promote deer hunting among the Maya.

## NOTES

<sup>1</sup>Relative importance value is an ecological measure, the sum of the relative frequency, relative abundance, and relative dominance for each species.

<sup>2</sup>Plant names (Maya, Spanish, and Latin) follow Sosa et al. (1985). Vouchers by different collectors (C. Chan, J.S. Flores, J.A. Gutiérrez, R. Lira, M. Narváez, A. Puch, Paulino Simá, Pedro Simá, E. Ucán Ek, C. Vargas, P. Yam) are deposited at *XAL* (Herbario, Instituto de Ecología, Xalapa, Veracruz, México) and *YUC* (Herbario, Centro de Recursos Bióticos de la Península de Yucatán, Mérida, Yucatán, México).

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## BOOK REVIEW

**The Potato: Evolution, Biodiversity, and Genetic Resources.** J.G. Hawkes. London: Belhaven Press, 1990. Pp. viii, 259. Photographs, maps, and a line drawing of floral parts. \$48.00. ISBN 87474-465-2.

Of all the gifts of the Andean chain to the world tobacco and the potato stand out as undoubtedly the most widely used economic plants. It is difficult to imagine life in North America and Europe without the potato. Great advances